

NPP/ VIIRS Level 2 Surface Reflectance Product Description

Surface reflectance is the fraction of incoming radiation at a particular wavelength or bandpass that is reflected from the land surface. The NPP/ VIIRS surface reflectance products are estimates of surface reflectance in each of the VIIRS reflective bands I1- I3, M1- M5, M7, M8, M10, and M11. Level 2 surface reflectance products are produced for the same swath data sets as the Land PEATE Level 1B swaths, each of which contains approximately five minutes' worth of data. Surface reflectance for each moderate-resolution (750m) or imagery-resolution (375m) pixel is retrieved separately in for the Level 2 products. Level 2G and Level 3 products are generated by performing spatial and temporal aggregation to 500m or 1km grids over daily or 8- day time periods.

Surface reflectance for each pixel and band is obtained by adjusting top- of- atmosphere reflectance to compensate for atmospheric effects. Corrections are made for the effects of molecular gases, including ozone and water vapor, and for the effects of atmospheric aerosols. The inputs to the surface reflectance algorithm are top- of- atmosphere reflectances for the VIIRS visible bands (NPP_VMAE_L1, NPP_VIAE_L1), VIIRS cloud mask and aerosol products (NPP-CMIP_L2), aerosol optical thickness (NPP_VAOTIP_L2, NPP_VAMIP_L2), and atmospheric data obtained from a reanalysis (surface pressure, atmospheric precipitable water, and ozone concentration).

All surface reflectance products are produced under daytime conditions only. In the LPEATE/IDPS (AS3001) versions of the surface reflectance products, water pixels and pixels that are low quality due to conditions such as the presence of aerosols, are excluded from processing prior to operational build versions prior to Mx83. The product is produced under all atmospheric conditions except for night and sea-water when using algorithm build version Mx83 and beyond. Pixels when not produced are replaced by fill values in the Level 2 and Level 2G products, and are not included in the Level 3 products. In the LPA (AS3002) and reprocessed (e.g. C11 in AS3110) versions of the surface reflectance products, all daytime pixels are processed, but lower quality data are not used in the Level 3 composites where higher quality data are available.

The following surface reflectance products are generated at Land PEATE and are distributed from the LAADS: Two Level 2 VIIRS surface reflectance products (imagery-resolution NPP_SRFLIIP_L2 and moderate-resolution NPP_SRFLMIP_L2), three Level 2G surface reflectance products (NPP_DSR1KDI_L2GD, NPP_DSRF1KD_L2GD, and NPP_DSRFHKD_L2GD), a tiled Level 3 daily surface reflectance (NPP_DSRFIP_L3), a global CMG- grid daily L3 surface reflectance (NPP_SRFLIP_CMG), and two multi- day surface reflectance products (NPP_D8SRF1KM_L3D and NPP_D8SRFHKM_L3D).

An example of a Level 2 surface reflectance granule is shown below, along with tables listing the Land PEATE VIIRS surface reflectance products, their MODIS equivalents, and a diagram illustrating the interdependencies between those products. As any other L2 swath products, the L2 surface reflectance product contains bow-tile deletion.

NOTE: There are seven bytes of quality flag data for each pixel in the LPA and reprocessed version (AS3002) of the data and in the IDPS/LPEATE version of the data from the algorithm build version Mx83 and beyond, but only six bytes of quality flags per pixel in the IDPS/LPEATE version of (AS3001) data prior to Mx83. A table specifying the land quality flag scheme for all VIIRS land surface reflectance products follows the file specification information.

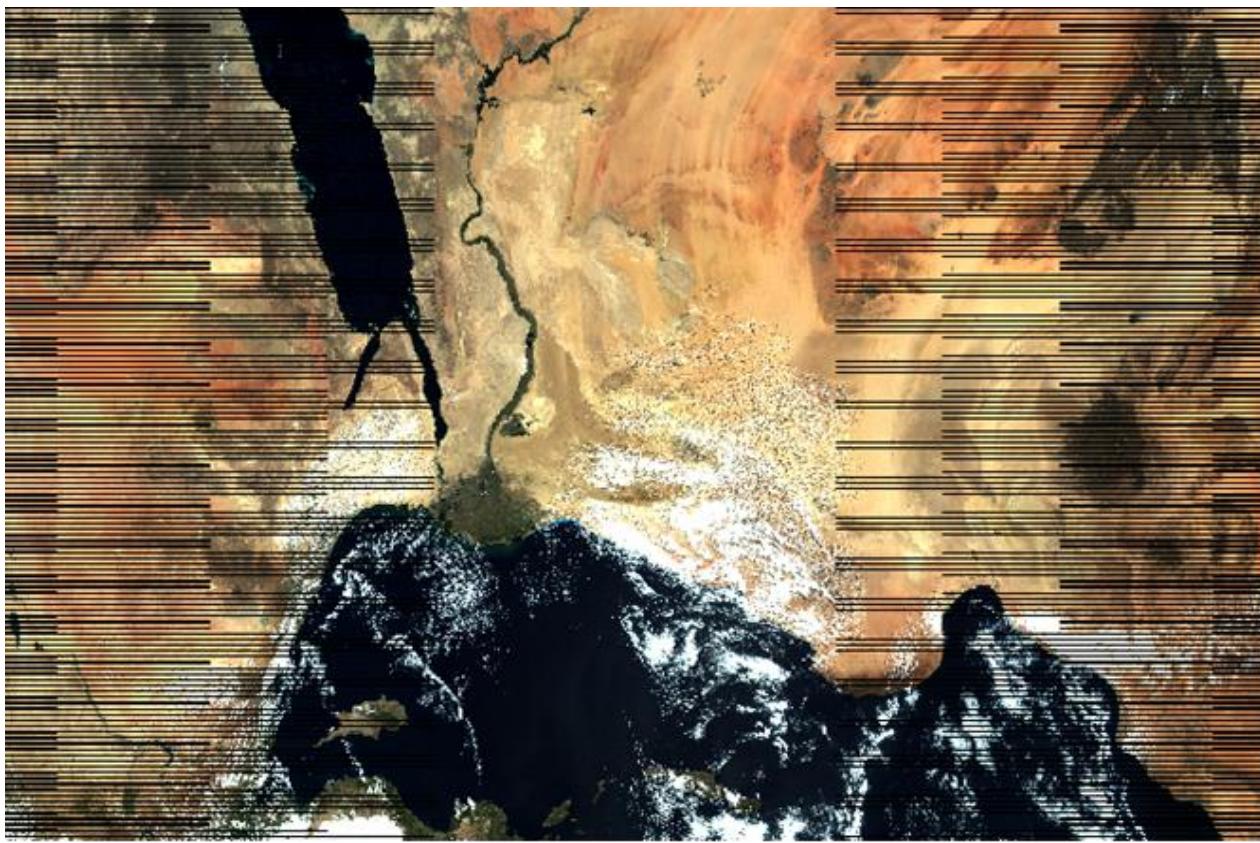


Figure 1: Sample Level 2 surface reflectance data. RGB image of bands M5, M4, and M3 from granule NPP_SRFLMIP_L2.A2013277.1110.P1_03002.2013278005541.hdf is shown.

Table 1: VIIRS bands included in Surface Reflectance products and nearest equivalent MODIS bands. Note that band equivalents are not exact matches.

VIIRS band	Band center (μm)	Bandwidth (μm)	Nearest equivalent MODIS band
I1	0.64	0.08	1
I2	0.865	0.039	2
I3	1.61	0.06	6
M1	0.412	0.02	8
M2	0.445	0.018	9
M3	0.488	0.02	3
M4	0.555	0.02	4
M5	0.672	0.02	1
M7	0.865	0.039	2
M8	1.240	0.02	5
M10	1.61	0.06	6

Table 2: Summary of land surface reflectance products produced at the Land PEATE

Product	Type/ format	Resolution	Found in Archive Sets	Notes
NPP_SRFLIIP_L2	Level 2 swath array, bands I1- I3	375m	3000/ IDPS, 3001/ LPEATE, 3002/ LPA	Only clear pixels retrieved in LPEATE; all daytime pixels retrieved in LPA.
NPP_SRFLMIP_L2	Level 2 swath array, bands M1- M5, M7, M8, M10, M11.	750m	3000/ IDPS, 3001/ LPEATE, 3002/ LPA	Only clear pixels retrieved in LPEATE; all daytime pixels retrieved in LPA.
NPP_DSR1KDI_L2GD	Daily Level 2G tile (multiple data layers), bands M1- M5, M7, M8, M10, M11.	1km	3001/ LPEATE, 3002/ LPA	Uses imagery-resolution pointer files. Input is NPP_SRFLMIP_L2.
NPP_DSRF1KD_L2GD	Daily Level 2G tile (multiple data layers), bands M1- M5, M7, M8, M10, M11.	1km	3001/ LPEATE, 3002/ LPA	Uses moderate-resolution pointer files. Input is NPP_SRFLMIP_L2.
NPP_DSRFHKD_L2GD	Daily Level 2G tile (multiple data layers), bands I1- I3	500m	3001/ LPEATE, 3002/ LPA	Input is NPP_SRFLIIP_L2.
NPP_SRFLIP_CMG	Daily global CMG grid, bands I1- I3	0.05°x 0.05° grid	3000/ IDPS, 3001/ LPEATE, 3002/ LPA	Input is NPP_SRFLIIP_L2.
NPP_DSRFIP_L3	Daily Level 3 tile product, one layer for each of bands M1- M5, M7, M8, M10, M11.	1km	3001/ LPEATE, 3002/ LPA	Input is NPP_SRFLMIP_L2.
NPP_D8SRF1KM_L3D	Level 3 tile product, 8-day composite, one layer for each of bands M1- M5, M7, M8, M10, M11.	1km	3001/ LPEATE, 3002/ LPA	Input is NPP_DSRF1KD_L2GD.
NPP_D8SRFHKM_L3D	Level 3 tile product, 8-day composite, one layer for each of bands I1- I3	500m	3001/ LPEATE, 3002/ LPA	Input is NPP_DSRFHKD_L2GD.

Table 3: NPP surface reflectance products and equivalent/ similar MODIS products

Description	NPP product	MODIS equivalent
Level 2 swath 375- m resolution surface reflectance, bands I1- I3	NPP_SRFLIIP_L2	MOD09 (different resolution)
Level 2 swath 750- m resolution surface reflectance, bands M1- M5, M7, M8, M10, M11	NPP_SRFLMIP_L2	MOD09 (different resolution)
Level 2G daily 1km- resolution surface reflectance, bands M1- M5, M7, M8, M10, and M11	NPP_DSR1KDI_L2GD	MOD09GA (with higher resolution pointer)
Level 2G daily 1km- resolution surface reflectance, bands M1- M5, M7, M8, M10, and M11	NPP_DSRF1KD_L2GD	MOD09GA
Level 2G daily 500m- resolution surface reflectance, bands I1- I3	NPP_DSRFHKD_L2GD	MOD09GHK
Level 3 daily global 0.05 degree resolution CMG grid surface reflectance, bands I1- I3	NPP_SRFLIP_CMG	MOD09CMG
Level 3 daily 1km- resolution surface reflectance, bands M1- M5, M7, M8, M10, M11	NPP_DSRFIP_L3	None
Level 3 8- day 1km- resolution surface reflectance, bands M1- M5, M7, M8, M10, M11	NPP_D8SRF1KM_L3D	MOD09A1 (different resolution)
Level 3 8-day 500m- resolution surface reflectance, bands I1- I3	NPP_D8SRFHKM_L3D	MOD09A1

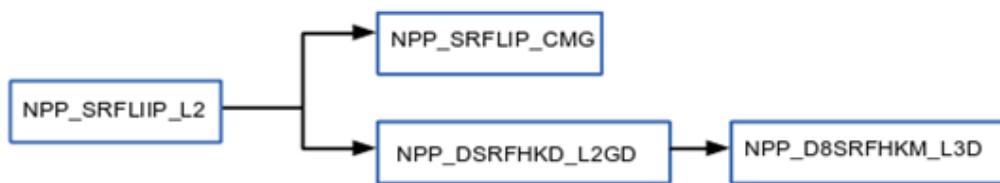


Figure 3: Interdependencies of NPP/ VIIRS surface reflectance products

NPP_SRFLIIP_L2 PRODUCT FILE SPECIFICATION

Dimensions:

Along_Track:SurfReflect_IP_Img
Along_Scan:SurfReflect_IP_Img
Along_Track_LQF:SurfReflect_IP_Img
Along_Scan_LQF:SurfReflect_IP_Img

Variables:

short i1(Along_Track:SurfReflect_IP_Img, Along_Scan:SurfReflect_IP_Img)

Scale = 9.9658944e-05f
Offset = 0.f

FILL VALUES: NA_UINT16_FILL = 65535
MISS_UINT16_FILL = 65534
ONBOARD_PT_UINT16_FILL = 65533
ONGROUND_PT_UINT16_FILL = 65532
ERR_UINT16_FILL = 65531
ELLIPSOID_UINT16_FILL = 65530
VDNE_UINT16_FILL = 65529
SOUB_UINT16_FILL = 65528

short i2(Along_Track:SurfReflect_IP_Img, Along_Scan:SurfReflect_IP_Img)

Scale = 9.9658944e-05f
Offset = 0.f

FILL VALUES: NA_UINT16_FILL = 65535
MISS_UINT16_FILL = 65534
ONBOARD_PT_UINT16_FILL = 65533
ONGROUND_PT_UINT16_FILL = 65532
ERR_UINT16_FILL = 65531
ELLIPSOID_UINT16_FILL = 65530
VDNE_UINT16_FILL = 65529
SOUB_UINT16_FILL = 65528

short i3(Along_Track:SurfReflect_IP_Img, Along_Scan:SurfReflect_IP_Img)

Scale = 9.9195749e-05f
Offset = 0.f

FILL VALUES: NA_UINT16_FILL = 65535
MISS_UINT16_FILL = 65534
ONBOARD_PT_UINT16_FILL = 65533
ONGROUND_PT_UINT16_FILL = 65532

ERR_UINT16_FILL = 65531
ELLIPSOID_UINT16_FILL = 65530
VDNE_UINT16_FILL = 65529
SOUB_UINT16_FILL = 65528

byte QF1_VIIRSSRIPSDR(Along_Track_LQF:SurfReflect_IP_Img,
Along_Scan_LQF:SurfReflect_IP_Img)

FILL VALUES: NA_UINT8_FILL = 255
MISS_UINT8_FILL = 254
ONBOARD_PT_UINT8_FILL = 253
ONGROUND_PT_UINT8_FILL = 252
ERR_UINT8_FILL = 251
ELLIPSOID_UINT8_FILL = 250
VDNE_UINT8_FILL = 249
SOUB_UINT8_FILL = 248

byte QF2_VIIRSSRIPSDR(Along_Track_LQF:SurfReflect_IP_Img,
Along_Scan_LQF:SurfReflect_IP_Img)

FILL VALUES: NA_UINT8_FILL = 255
MISS_UINT8_FILL = 254
ONBOARD_PT_UINT8_FILL = 253
ONGROUND_PT_UINT8_FILL = 252
ERR_UINT8_FILL = 251
ELLIPSOID_UINT8_FILL = 250
VDNE_UINT8_FILL = 249
SOUB_UINT8_FILL = 248

byte QF3_VIIRSSRIPSDR(Along_Track_LQF:SurfReflect_IP_Img,
Along_Scan_LQF:SurfReflect_IP_Img)

FILL VALUES: NA_UINT8_FILL = 255
MISS_UINT8_FILL = 254
ONBOARD_PT_UINT8_FILL = 253
ONGROUND_PT_UINT8_FILL = 252
ERR_UINT8_FILL = 251
ELLIPSOID_UINT8_FILL = 250
VDNE_UINT8_FILL = 249
SOUB_UINT8_FILL = 248

byte QF4_VIIRSSRIPSDR(Along_Track_LQF:SurfReflect_IP_Img,
Along_Scan_LQF:SurfReflect_IP_Img)

FILL VALUES: NA_UINT8_FILL = 255
MISS_UINT8_FILL = 254
ONBOARD_PT_UINT8_FILL = 253
ONGROUND_PT_UINT8_FILL = 252
ERR_UINT8_FILL = 251

ELLIPSOID_UINT8_FILL = 250
VDNE_UINT8_FILL = 249
SOUB_UINT8_FILL = 248

byte QF5_VIIRSSRIPSDR(Along_Track_LQF:SurfReflect_IP_Img,
Along_Scan_LQF:SurfReflect_IP_Img)

FILL VALUES: NA_UINT8_FILL = 255
MISS_UINT8_FILL = 254
ONBOARD_PT_UINT8_FILL = 253
ONGROUND_PT_UINT8_FILL = 252
ERR_UINT8_FILL = 251
ELLIPSOID_UINT8_FILL = 250
VDNE_UINT8_FILL = 249
SOUB_UINT8_FILL = 248

byte QF6_VIIRSSRIPSDR(Along_Track_LQF:SurfReflect_IP_Img,
Along_Scan_LQF:SurfReflect_IP_Img)

FILL VALUES: NA_UINT8_FILL = 255
MISS_UINT8_FILL = 254
ONBOARD_PT_UINT8_FILL = 253
ONGROUND_PT_UINT8_FILL = 252
ERR_UINT8_FILL = 251
ELLIPSOID_UINT8_FILL = 250
VDNE_UINT8_FILL = 249
SOUB_UINT8_FILL = 248

***** NOTE: QF7_VIIRSSRIPSSDR byte is only included in AS3002/ LandPEATE Adjusted data,
and is not present in the AS3001/ LPEATE data. *****

byte QF7_VIIRSSRIPSDR(Along_Track_LQF:SurfReflect_IP_Img,
Along_Scan_LQF
:SurfReflect_IP_Img)

FILL VALUES: NA_UINT8_FILL = 255
MISS_UINT8_FILL = 254
ONBOARD_PT_UINT8_FILL = 253
ONGROUND_PT_UINT8_FILL = 252
ERR_UINT8_FILL = 251
ELLIPSOID_UINT8_FILL = 250
VDNE_UINT8_FILL = 249
SOUB_UINT8_FILL = 248

NPP_SRFLMIP_L2 PRODUCT FILE SPECIFICATION

Dimensions:

Along_Track:SurfReflect_IP_Mod
Along_Scan:SurfReflect_IP_Mod
Along_Track_LQF:SurfReflect_IP_Mod
Along_Scan_LQF:SurfReflect_IP_Mod

Variables:

short m1(Along_Track:SurfReflect_IP_Mod, Along_Scan:SurfReflect_IP_Mod)

Scale = 9.9195749e-05f
Offset = 0.f

FILL VALUES: NA_UINT16_FILL = 65535
MISS_UINT16_FILL = 65534
ONBOARD_PT_UINT16_FILL = 65533
ONGROUND_PT_UINT16_FILL = 65532
ERR_UINT16_FILL = 65531
ELLIPSOID_UINT16_FILL = 65530
VDNE_UINT16_FILL = 65529
SOUB_UINT16_FILL = 65528

short m2(Along_Track:SurfReflect_IP_Mod, Along_Scan:SurfReflect_IP_Mod)

Scale = 9.9195749e-05f
Offset = 0.f

FILL VALUES: NA_UINT16_FILL = 65535
MISS_UINT16_FILL = 65534
ONBOARD_PT_UINT16_FILL = 65533
ONGROUND_PT_UINT16_FILL = 65532
ERR_UINT16_FILL = 65531
ELLIPSOID_UINT16_FILL = 65530
VDNE_UINT16_FILL = 65529
SOUB_UINT16_FILL = 65528

short m3(Along_Track:SurfReflect_IP_Mod, Along_Scan:SurfReflect_IP_Mod)

Scale = 9.9195749e-05f
Offset = 0.f

FILL VALUES: NA_UINT16_FILL = 65535

MISS_UINT16_FILL = 65534
ONBOARD_PT_UINT16_FILL = 65533
ONGROUND_PT_UINT16_FILL = 65532
ERR_UINT16_FILL = 65531
ELLIPSOID_UINT16_FILL = 65530
VDNE_UINT16_FILL = 65529
SOUB_UINT16_FILL = 65528

short m4(Along_Track:SurfReflect_IP_Mod, Along_Scan:SurfReflect_IP_Mod)

Scale = 9.9195749e-05f

Offset = 0.f

FILL VALUES: NA_UINT16_FILL = 65535
MISS_UINT16_FILL = 65534
ONBOARD_PT_UINT16_FILL = 65533
ONGROUND_PT_UINT16_FILL = 65532
ERR_UINT16_FILL = 65531
ELLIPSOID_UINT16_FILL = 65530
VDNE_UINT16_FILL = 65529
SOUB_UINT16_FILL = 65528

short m5(Along_Track:SurfReflect_IP_Mod, Along_Scan:SurfReflect_IP_Mod)

Scale = 9.9195749e-05f

Offset = 0.f

FILL VALUES : NA_UINT16_FILL = 65535
MISS_UINT16_FILL = 65534
ONBOARD_PT_UINT16_FILL = 65533
ONGROUND_PT_UINT16_FILL = 65532
ERR_UINT16_FILL = 65531
ELLIPSOID_UINT16_FILL = 65530
VDNE_UINT16_FILL = 65529
SOUB_UINT16_FILL = 65528

short m7(Along_Track:SurfReflect_IP_Mod, Along_Scan:SurfReflect_IP_Mod)

Scale = 9.9195749e-05f

Offset = 0.f

FILL VALUES: NA_UINT16_FILL = 65535
MISS_UINT16_FILL = 65534
ONBOARD_PT_UINT16_FILL = 65533
ONGROUND_PT_UINT16_FILL = 65532
ERR_UINT16_FILL = 65531

ELLIPSOID_UINT16_FILL = 65530
VDNE_UINT16_FILL = 65529
SOUB_UINT16_FILL = 65528"

short m8(Along_Track:SurfReflect_IP_Mod, Along_Scan:SurfReflect_IP_Mod)

Scale = 9.9195749e-05f
Offset = 0.f

FILL VALUES: NA_UINT16_FILL = 65535
MISS_UINT16_FILL = 65534
ONBOARD_PT_UINT16_FILL = 65533
ONGROUND_PT_UINT16_FILL = 65532
ERR_UINT16_FILL = 65531
ELLIPSOID_UINT16_FILL = 65530
VDNE_UINT16_FILL = 65529
SOUB_UINT16_FILL = 65528

short m10(Along_Track:SurfReflect_IP_Mod, Along_Scan:SurfReflect_IP_Mod)

Scale = 9.9195749e-05f
Offset = 0.f

FILL VALUES: NA_UINT16_FILL = 65535
MISS_UINT16_FILL = 65534
ONBOARD_PT_UINT16_FILL = 65533
ONGROUND_PT_UINT16_FILL = 65532
ERR_UINT16_FILL = 65531
ELLIPSOID_UINT16_FILL = 65530
VDNE_UINT16_FILL = 65529
SOUB_UINT16_FILL = 65528

short m11(Along_Track:SurfReflect_IP_Mod, Along_Scan:SurfReflect_IP_Mod)

Scale = 9.9195749e-05f
Offset = 0.f

FILL VALUES: NA_UINT16_FILL = 65535
MISS_UINT16_FILL = 65534
ONBOARD_PT_UINT16_FILL = 65533
ONGROUND_PT_UINT16_FILL = 65532
ERR_UINT16_FILL = 65531
ELLIPSOID_UINT16_FILL = 65530
VDNE_UINT16_FILL = 65529
SOUB_UINT16_FILL = 65528

byte QF1_VIIRSSRIPSDR(Along_Track_LQF:SurfReflect_IP_Mod,
Along_Scan_LQF:SurfReflect_IP_Mod)

FILL VALUES: NA_UINT8_FILL = 255
MISS_UINT8_FILL = 254
ONBOARD_PT_UINT8_FILL = 253
ONGROUND_PT_UINT8_FILL = 252
ERR_UINT8_FILL = 251
ELLIPSOID_UINT8_FILL = 250
VDNE_UINT8_FILL = 249
SOUB_UINT8_FILL = 248

byte QF2_VIIRSSRIPSDR(Along_Track_LQF:SurfReflect_IP_Mod,
Along_Scan_LQF:SurfReflect_IP_Mod)

FILL VALUES: NA_UINT8_FILL = 255
MISS_UINT8_FILL = 254
ONBOARD_PT_UINT8_FILL = 253
ONGROUND_PT_UINT8_FILL = 252
ERR_UINT8_FILL = 251
ELLIPSOID_UINT8_FILL = 250
VDNE_UINT8_FILL = 249
SOUB_UINT8_FILL = 248

byte QF3_VIIRSSRIPSDR(Along_Track_LQF:SurfReflect_IP_Mod,
Along_Scan_LQF:SurfReflect_IP_Mod)

FILL VALUES: NA_UINT8_FILL = 255
MISS_UINT8_FILL = 254
ONBOARD_PT_UINT8_FILL = 253
ONGROUND_PT_UINT8_FILL = 252
ERR_UINT8_FILL = 251
ELLIPSOID_UINT8_FILL = 250
VDNE_UINT8_FILL = 249
SOUB_UINT8_FILL = 248

byte QF4_VIIRSSRIPSDR(Along_Track_LQF:SurfReflect_IP_Mod,
Along_Scan_LQF:SurfReflect_IP_Mod)

FILL VALUES: NA_UINT8_FILL = 255
MISS_UINT8_FILL = 254
ONBOARD_PT_UINT8_FILL = 253
ONGROUND_PT_UINT8_FILL = 252
ERR_UINT8_FILL = 251
ELLIPSOID_UINT8_FILL = 250
VDNE_UINT8_FILL = 249

SOUB_UINT8_FILL = 248

byte QF5_VIIRSSRIPSDR(Along_Track_LQF:SurfReflect_IP_Mod,
Along_Scan_LQF:SurfReflect_IP_Mod)

FILL VALUES: NA_UINT8_FILL = 255
 MISS_UINT8_FILL = 254
 ONBOARD_PT_UINT8_FILL = 253
 ONGROUND_PT_UINT8_FILL = 252
 ERR_UINT8_FILL = 251
 ELLIPSOID_UINT8_FILL = 250
 VDNE_UINT8_FILL = 249
 SOUB_UINT8_FILL = 248

byte QF6_VIIRSSRIPSDR(Along_Track_LQF:SurfReflect_IP_Mod,
Along_Scan_LQF:SurfReflect_IP_Mod)

FILL VALUES: NA_UINT8_FILL = 255
 MISS_UINT8_FILL = 254
 ONBOARD_PT_UINT8_FILL = 253
 ONGROUND_PT_UINT8_FILL = 252
 ERR_UINT8_FILL = 251
 ELLIPSOID_UINT8_FILL = 250
 VDNE_UINT8_FILL = 249
 SOUB_UINT8_FILL = 248

***** NOTE: QF7_VIIRSSRIPSSDR byte is only included in AS3002/ LandPEATE Adjusted data, and is not present in the AS3001/ LPEATE data. *****

byte QF7_VIIRSSRIPSDR(Along_Track_LQF:SurfReflect_IP_Mod,
Along_Scan_LQF
:SurfReflect_IP_Mod)

FILL VALUES: NA_UINT8_FILL = 255
 MISS_UINT8_FILL = 254
 ONBOARD_PT_UINT8_FILL = 253
 ONGROUND_PT_UINT8_FILL = 252
 ERR_UINT8_FILL = 251
 ELLIPSOID_UINT8_FILL = 250
 VDNE_UINT8_FILL = 249
 SOUB_UINT8_FILL = 248

Table 4: Surface reflectance quality flag scheme

Note that bit 7 is present in LPA/ AS3002 product but not LPEATE/AS3001 product.

Byte	Bits	Quality flag	Values
1	0-1	Cloud mask quality	00 Poor 01 Low 10 Medium 11 High
	2-3	Cloud detection & confidence	00 Confident clear 01 Probably clear 10 Probably cloudy 11 Confident cloudy
	4	Day/night	0 Day 1 Night
	5	Low sun mask	0 High 1 Low
	6-7	Sun glint	00 None 01 Geometry based 10 Wind speed based 11 Geometry & wind speed based
2	0-2	Land/water background	000 Land & desert 001 Land no desert 010 Inland water 011 Sea water 101 Coastal
	3	Shadow mask	0 No cloud shadow

			1 Shadow
4	Heavy aerosol mask	0 No heavy aerosol 1 Heavy aerosol	
5	Snow/ice	0 No snow/ice 1 Snow or ice	
6	Thin cirrus reflective	0 No cloud 1 Cloud	
7	Thin cirrus emissive	0 No cloud 1 Cloud	
3	0	Bad M1 SDR data	0 No 1 Yes
	1	Bad M2 SDR data	0 No 1 Yes
	2	Bad M3 SDR data	0 No 1 Yes
	3	Bad M4 SDR data	0 No 1 Yes
	4	Bad M5 SDR data	0 No 1 Yes
	5	Bad M7 SDR data	0 No 1 Yes
	6	Bad M8 SDR data	0 No 1 Yes
	7	Bad M10 SDR data	0 No 1 Yes
4	0	Bad M11 SDR data	0 No 1 Yes
	1	Bad I1 SDR data	0 No

			1 Yes
2	Bad I2 SDR data	0 No 1 Yes	
3	Bad I3 SDR data	0 No 1 Yes	
4	Overall quality of AOT	0 Good 1 Bad	
5	Missing AOT input data;	0 No 1 Yes	
6	Invalid land AM input data	0 Valid 1 Invalid AMI over land or over ocean	
7	Missing PW input data	0 No 1 Yes	
5	0	Missing OZ input data	0 No 1 Yes
	1	Missing SP input data	0 No 1 Yes
	2	Overall quality M1 SR data	0 Good 1 Bad
	3	Overall quality M2 SR data	0 Good 1 Bad
	4	Overall quality M3 SR data	0 Good 1 Bad
	5	Overall quality M4 SR data	0 Good 1 Bad
5	6	Overall quality M5 SR data	0 Good 1 Bad
	7	Overall quality M7 SR data	0 Good 1 Bad

6	0	Overall quality M8 SR data	0 Good 1 Bad
	1	Overall quality M10 SR data;	0 Good 1 Bad
	2	Overall quality M11 SR data	0 Good 1 Bad
	3	Overall quality I1 SR data	0 Good 1 Bad
	4	Overall quality I2 SR data	0 Good 1 Bad
	5	Overall quality I3 SR data	0 Good 1 Bad
	6-7	Unused	
7	0	Snow present	0 No 1 Yes
	1	Adjacent to cloud	0 No 1 Yes
	2-3	Aerosol quantity	00 Climatology 01 Low 10 Average 11 High
	4	Thin cirrus flag	0 No 1 Yes
	5-7	Unused	